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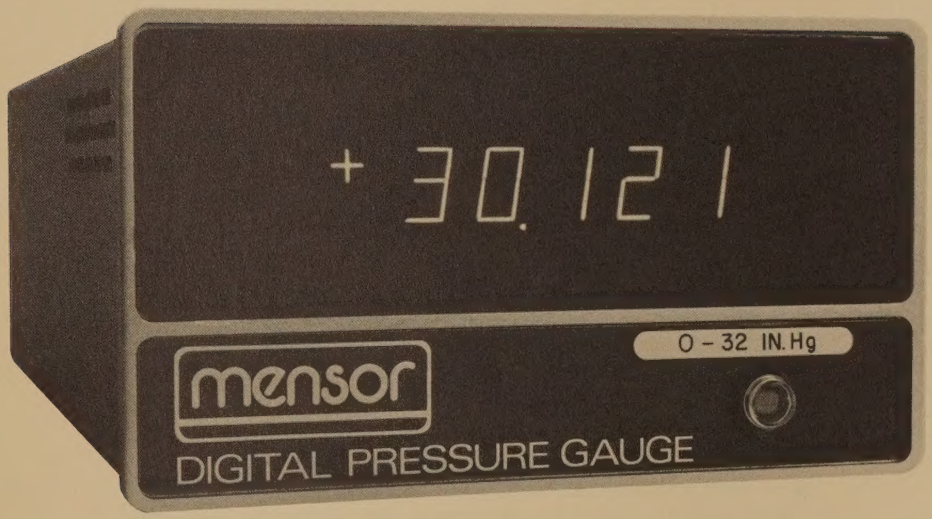
CORPORATION

SAN MARCOS, TEXAS

mensor DIGITAL PRESSURE GAUGE
MODEL 11900



OPERATION MANUAL

MENSOR DIGITAL PRESSURE GAUGE
MODEL 11900
OPERATING INSTRUCTIONS

The Mensor Digital Pressure Gauge precisely measures and displays pressure. With proper care, this instrument will give you years of trouble-free performance.

Before attempting to use this instrument, please read these instructions carefully.

Additional copies of these instructions are available from Mensor Corporation.

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Manual P/N
A 11840001 F

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1.0 OPERATION

1.1 Unpacking

The Model 11900 Digital Pressure Gauge (DPG) is shipped in a protective carton containing one each of the following items:

(a) Digital Pressure Gauge
(b) Line cord (3-wire)
(c) Connector, (Amphenol #57-30240, 24 pin)
(d) DPG Operation Manual
(e) DPG Calibration Chart
(f) Warranty Sheet

If the carton shows signs of rough handling or damage, inspect the DPG carefully and report the damage to the shipping company immediately. If the shipper cannot be contacted, notify Mensor Corporation.

1.2 Operating Controls and Pressure Connections

The front and rear panel controls and connections are shown in Figure 1.2, and their functions are described in Table 1.2.

1.3 Putting the DPG into operation

Operation of the DPG is simple, requiring only minimal adjustments by the user. It is important however, that Sections 1.4 and 1.5 of this manual be read before attempting to use the DPG.

When the DPG is first put into operation, there are a few simple checks to tell if the unit is functioning properly; they are described in Sections 1.3.1 through 1.3.5.

1.3.1 The pressure connections are located at the rear of the instrument and the factory-installed plastic plugs must be removed at this time.

On the differential unit, there are two plastic plugs in the ports marked PRESS and REF. Remove both of these plugs.

On the absolute unit, the upper port is marked PRESS and contains a metal plug. The lower port is also marked PRESS and contains a plastic plug. Remove the plastic plug only.

1.3.2 Connect the power cord to the rear of the DPG and the other end to the proper AC power supply (115V, 60Hz in the U.S.A.).

1.3.3 Push the front panel power switch so that the green dot shows in the button. The digital display will light up, indicating the pressure at the rear ports. If the display does not light up, make sure that the power cord is plugged in properly at <u>both</u> ends, check for proper line voltage, and check the fuses in the rear of the DPG.

- CAUTION -
Care should be taken to protect against electrical shock when removing the fuses. Remove the power plug first!

1.3.4 Allow the instrument to warm up for a few minutes and check the display for proper zero indication.

On differential units, the display should be within a few counts (least significant digit) of 00000.

On absolute units, the display should indicate the local barometric pressure, for example: 29.813 inches of mercury absolute or its equivalent in other units.

1.3.5 Check the display for an upscale indication of pressure as follows: place a finger over the PRESS port and push slightly. The display numbers should <u>increase</u> a few counts, depending on the amount of pressure and the instrument span.

1.3.6 This completes the initial checks. If the unit fails to pass these tests, contact Mensor Corporation before applying pressure to the unit.

When contacting the factory concerning your DPG, please mention the part number and serial number as shown on the label on the rear of the instrument.

If the instrument passes the initial checks, it is now ready for use and can be connected to a pressure source as described in Section 1.4.

When pressure is applied to the DPG, the pressure is displayed directly in engineering units and should be within the range specified on the front of the unit.

The relationship between pressure ranges and instrument span are shown graphically for various engineering units in Table 1.3.6.

1.4 Pressure Connections and Media

The pressure connections provided on the DPG are described in Section 2.3.

1.4.1 When fittings are ordered with the instrument, they are installed at the factory.

If the user supplies the fittings, they should be installed as follows:

Use Teflon pipe tape or Loctite hydraulic sealant on the male thread. Apply a turn and a half of tape, starting back from the end. If liquid sealant is used, a moderate amount applied to the first two threads is adequate.

NOTE: Keep fittings clean and replace them when they become worn. Worn, scratched or dirty fitting seats may cause leaks. Repeated making and breaking of flare type fittings may cause the seat to not mate properly.

Leaks in the system cause pressure gradients which result in significant measurement errors.

1.4.2 The DPG can be used to measure the pressure of gasses, or liquids.

When gasses are used as the pressure medium, they must be clean, dry, and non-corrosive.

When liquid pressure measurements are required, the pressure port of a differential unit is filled with the liquid at the factory.

NOTE: Liquids cannot be used in absolute transducers or in the REF port of differential units.

When connecting the liquid medium to the PRESS port on the differential unit, verify that the following are done:

1. Bleed hydraulic lines to eliminate trapped air.
2. Correct for head pressure per Section 3.7.

- CAUTION -
Do not over-pressurize your instrument! Each instrument is factory tested to assure a reasonable safety margin above the rated pressure span. Normal operations should be within the rated span. Instantaneous over-pressures should not exceed those shown below.

Span Range, PSI (see label on front)	Instantaneous Over-Pressure Percent Full Scale
1 - 10	100
10 - 199	100
200 - 999	50
1000 - 2500	25

On the differential units, before applying reference pressure, care should be taken to assure that the applied pressure does not exceed the maximum plus or minus differential rating of the instrument.

> - CAUTION -
>
> The maximum reference pressure for any differential unit is 500 PSI.

1.5 Zero Adjustment

The display may be adjusted to the proper zero indication by means of a potentiometer located on the front of the instrument (Item 3, Figure 1.2).

1.5.1 With differential or gauge pressure measuring instruments, zero differential pressure is achieved by shunting the pressure and reference ports or by venting both ports to atmosphere. Adjust the zero pot so that the display indicates 00000.

1.5.2 With absolute units, the procedure is as follows:

> - CAUTION -
>
> In instruments with absolute pressure sensors, do not use helium or helium-contaminated pressure supply.

1. The reference pressure is sealed into the quartz Bourdon tube in the transducer at the factory, and is negligible (less than 1.0 millitorr).

2. The applied pressure must be accurately known or, it should be less than the resolution of the DPG.

3. The recommended method of establishing a low pressure differential is to evacuate the pressure port with a vacuum pump, down to 10 to 60 millitorr, and monitor the pressure with a thermocouple vacuum gauge. The accuracy of the vacuum gauge in this pressure region is about ±5 millitorr, which is usually less than the resolution of the DPG.

   We recommend that the vacuum gauge tube be installed in the upper pressure port (1/8 NPT). This will assure the most accurate vacuum reading. Because vacuum systems have pressure gradients which vary with outgassing and pump speeds, it is important to measure the pressure as close to the quartz Bourdon tube as possible.

   Vacuum gauges and gauge tubes are available as accessories from Mensor. See Options D and E, Section 2.3.

- CAUTION -
Do not apply more than 50 PSIA to the vacuum gauge tube. Energizing the gauge tube at pressures above atmospheric decreases its life.

4. From the pressure indicated on the vacuum gauge, calculate the equivalent reading. Table 1.5.2 may be used to convert millitorrs to inches of mercury absolute (in.HgA) or pounds per square inch absolute (PSIA).

5. Set the equivalent reading in the display using the zero pot on the front of the instrument.

EXAMPLE: Absolute Transducer

Range = 0-30 in.HgA

Least significant digit = 0.001 in.HgA

Evacuated to 60 millitorr

From Table 1.5.2, 60mt = 0.00236 in.HgA

Set the display to read 00.002

1.5.3 When it is desirable to measure absolute pressures with the differential DPG, you may want to order a vacuum gauge tube for the reference port. Be cautious when setting zero on the differential DPG with vacuum on both ports. When both ports are shunted and evacuated, the DPG temporarily reads negative. This is because the reference chamber outgasses more than the quartz Bourdon helix and therefore has a higher pressure. This outgassing will gradually diminish and, as it does, the two pressures will approach each other and the instrument will appear to drift upscale after zeroing. Either let the instrument pump for several hours or use a higher pressure (such as 0.1 in.HgA) to establish zero. The more often the DPG is evacuated the faster and lower it will pump down the next time.

NOTE: Do not plug the REF port on a differential DPG. Trapped gas on either port will cause the DPG to track temperature changes.

1.6 Auxiliary Connections

The auxiliary connections are provided on a 24 pin connector located on the rear of the DPG.

The connections include: analog voltage or optional current output proportional to the applied pressure, parallel (BCD) outputs, corresponding to the front panel display, and digital input/output controls for the digital display panel meter. See Table 1.6 and the electrical schematic in Appendix C.

For the analog levels present, see Section 2.3, Specifications. The logic levels, present at the connector, are DTL and TTL compatible and capable of driving one TTL load.

1.6.1 Inhibit Function

Grounding (BCD Common) the INHIBIT contact causes the display, and the parallel BCD output, to maintain its reading regardless of pressure changes at the transducer. A high logic level (or open) on the INHIBIT contact enables the display, and allows BCD output to update.

1.6.2 Polarity Function

The polarity function goes high when the polarity of the input signal is positive.

1.6.3 Data Ready Function

The data ready signal goes low to indicate the completion of a conversion process and remains low until the next conversion process is started. During this time the BCD and polarity outputs represent the value of the measurement and are available for use by an external device. The data ready signal normally remains low for at least 20 milliseconds, but this time may be extended indefinitely with a low level on the inhibit input.

2.0 GENERAL

2.1 Instrument Design

The Mensor DPG is a high accuracy pressure measuring instrument, which displays pressure in engineering units. The pressure measuring device employed in the DPG is a force-balanced quartz transducer. Because the instrument is direct reading, interpolation data is not required.

The theory of operation of the transducer is discussed in Section 4 of this manual.

Two basic instruments are available:

1. Differential
2. Absolute

The differential DPG is capable of measuring pressure in three modes: absolute, differential, and gauge.

The absolute DPG measures absolute pressures only.

The DPG consists of three basic modules: Readout Assembly, Power Supply, and Transducer.

2.1.1 Readout Assembly

The standard readout assembly is a highly stable digital panel meter (DPM) with a 4-3/4 digit (39999 maximum) display. This meter can be modified to provide a readout to 50000 counts (Option J, Section 2.2). The display consists of 1/2" high 7-segment planar gas discharge indicators which provide high light output digits and an automatically positioned decimal point. A lighted negative polarity signal is provided.

On all meters except those modified for 50K count, meter overrange is indicated by a blinking display.

Display storage is provided until a new reading (conversion) has been accomplished; therefore, the display is steady except for instantaneous transitions to new readings. The standard conversion rate is 5/sec. Conversion rates to 20/sec can be provided as a special option.

The DPM provides a TTL compatable parallel, latched, positive true BCD output.

The DPM is normally connected for operation from an AC line of 115 volts, 50/60 Hz. It can also be connected for 230 volt, 50/60 Hz (Option F, Section 2.2).

2.1.2 Power Supply

The power supply is a simple, unregulated 12 VDC supply which provides power to the transducer assembly. The power supply normally operates on 115 VAC, 50/60 Hz but can be modified to operate on 230 VAC, 50/60 Hz (option F).

2.1.3 Transducer

The transducer is a self-contained pressure measuring device which provides a linear voltage output that is proportional to the pressure input.

The transducer can be modified to produce a linear current output as well (Option H, Section 2.2).

See Section 4 for details of the transducer operation.

2.2 Options and Accessories

2.2.1 Option A - Rack Adapter

A special tray (to hold the instrument) mounts behind a standard rack panel and provides a tie-down thumb screw to secure the instrument. See Figure 2.2 for the rack adapter outline dimensions.

2.2.2 Option B - Rack Adapter Panel

A 19 inch wide by 5.22 inch high panel with one or two cutouts for the rack adapter listed above. Number of cutouts must be specified. See Figure 2.2.

2.2.3 Option C - Handle

A handle is mounted on the side of the instrument.

2.2.4 Option D - Gauge Tube

A vacuum gauge tube to mount in the 1/8 NPT pressure port provided on the rear of the DPG when an absolute pressure transducer is used. This tube is used with the readout vacuum gauge listed below in option E. The use of a gauge tube on the instrument allows for more accurate checking and setting of the instrument ZERO when a vacuum is applied to the absolute transducer. For longest life, the gauge tube must not be used at pressures above 50 PSIA, and should not be energized above one atmosphere.

2.2.5 Option E - Vacuum Gauge

A table-mounted meter, calibrated from zero to 1000 millitorr, used with the gauge tube in option D to monitor the vacuum in the DPG transducer. The vacuum gauge is powered from 115V, 50/60 Hz, or 230V, 50 Hz on request.

2.2.6 Option F - Non Standard

The instrument's power supply and readout assembly are factory wired and fused to operate on 200 to 250 volts 50/60 Hz mains.

2.2.7 Option G - External Relief Valves

An externally mounted pressure pop-off relief valve can be mounted on the rear pressure port of the DPG. A tee is provided to make this connection. Relief ranges from 0.5 PSI to 3000 PSI may be specified. A setting of 10% over span is recommended.

2.2.8 Option H - Current Output

For applications where remote recording or control is required, the DPG can be modified to provide a current output instead of voltage. The current is linear from 4 to 20 milliamps for any zero to full scale pressure range. A self-contained 25 volt reference is provided, but a load resistance of zero to 1000 ohms external to the instrument is required.

2.2.9 Option J - 50000 count

This option modifies the digital panel meter so that its range is extended from 39999 to 50000. It is recommended where greater resolution is needed or when the number 4 or 5 is the first digit of the full scale span. When this option is installed, the digital INHIBIT function is no longer available on the rear connector.

2.2.10 Option L - Liquid Filled Bourdon

The DPG can be used for liquid gauge pressure measurements if the Bourdon is liquid filled at the factory. The Bourdon is filled with a compatable media, such as distilled water, light hydraulic oil, light silicone oil, etc. Mensor uses a special technique to fill the Bourdon to eliminate trapping air in the Bourdon helix. (The user should not attempt to fill the Bourdon with a liquid, since this may result in damage to the helix.)

2.2.11 Option N- Multiple Pressure Units Switch

Automatic pressure units conversion is accomplished by a front panel mounted switch. Any DPG can utilize this special option. Engineering units are chosen by the customer. * With this front panel switch the user does not have to stop to make pressure units conversions. The user simply switches from "PSI" to "In.HgA" (for example) by operating the switch.

*The maximum number of switch positions is 5. Each switch position represents a different conversion.

2.3 Specifications

2.3.1 Measurement

ACCURACY/STABILITY	
Zero Drift	Temperature ± 0.002%F.S./°C Time ± 0.04% in 90 days Zero may be reset without affecting span or linearity
Span	Temperature ± 0.001%F.S./°C Time ± 0.02% in 90 days Span may be reset without affecting zero or linearity
Non-Linearity	±0.008% full scale ± 1 least significant digit over operating temperature range for 90 days
Hysteresis	Less than least significant digit
Total instrument accuracy after resetting zero at the operating temperature, ± 0.04%F.S. for 90 days	

EFFECT OF GRAVITY OR ORIENTATION	
Zero	0.03% F.S. max. in any orientation May be removed by resetting zero
Span	No effect

Response time for full scale step pressure input Time Constant for 99% Full Scale	
Display and BCD output	1.5 seconds
Analog	0.1 seconds

Analog (standard)	Zero to +5 VDC for spans greater than 5 PSI (1 milliamp max. load)			
	1.0 VDC per 10,000 counts on the display for spans less than 5 PSI			
Analog accuracy	± .04% of reading ± 2 millivolts			
Optional current	4 to 20 milliamps (25 volt internal supply) into zero to 1,000 ohms load			
Current accuracy	± .04% of reading + .008 ma			
Digital input/ output		Requirement		Function
		Low Level	High Level	Input/ Output
	Input	0 to .8V sink .2ma	+2.0 to +5.0V source .04ma	Inhibit
	Output	0 to +.4V sink 1.6 ma	+2.4 to 5.5V source 0.4 ma	5-digit parallel BCD, polarity data ready
Connector	24 pin; mating connector is furnished (Amphenol #57-30240)			

2.3.3 Physical Properties (See Figure 2.3)

Width	6.0 inches
Height	3.6 inches
Length	11.2 inches
Mechanical Shock	3 g's max
Weight	6.5 pounds

TRANSDUCER VOLUME (CUBIC CENTIMETERS)

	Pressure side	Reference side
Differential unit	0.4 to 0.6 cc	116 cc
Absolute unit	116 cc	N/A

PORTS

	Pressure	Reference
Differential unit	1/8 NPT	1/4 NPT
Absolute unit	1/8 and 1/4 NPT	N/A

TEMPERATURE RANGES

	Deg. F	Deg. C
Operating Storage	32 to 122 -22 to 176	0 to 50 -30 to 80

POWER

Standard	115 Volts AC, + 10% 50/60 Hz
Line voltage variation	Less than + one least significant digit effect for + 10% voltage variation.
Watts	10 max
Optional power	230 volts AC, + 10% 50/60 Hz

MOUNTING

Standard	Table Model
Optional	Rack adapter or handle

	Chamber	
Differential unit	Pressure	Reference
Absolute units	N/A	Pressure
Metallics		
Aluminum	X	X
Brass	X	X
Cadmium		X
Copper		X
Gold		X
Invar (36)	X	X
Iron		X
Phospher Bronze		X
Platinum	X	X
Silver	X	X
Silver solder	X	X
Solder (60/40)		X
Stainless steel (316)	X	X
Non-Metallics		
Buna-N rubber	X	X
Epoxy		X
Fiberglass		X
Loctite sealant	X	X
Mylar		X
Nylon		X
PVC		X
Quartz	X	X
Silicone grease	X	X
Silicone rubber		X
Teflon		X

* Pressure media: clean, dry, non-corrosive gasses. Consult Mensor Corporation for applications requiring hydraulic fluid filled pressure sensors.

3.0 CALIBRATION

The Mensor Model 11900 DPG is extremely precise and stable. The instrument should maintain its accuracy for longer than the 90-day specified period, however, it is advisable to verify the calibration periodically. When doing so, follow all procedures carefully and observe all precautions.

3.1 Calibration Verification

Mensor Corporation recommends that a performance history log be established and maintained. Factory performance test data should be the first entry in the log. In order to have a locally available test performance for comparison, it is suggested that the instrument be tested against a pressure standard before it is put in service and the test results be recorded at that time. The instrument should be checked thereafter at least every three months until a confidence level is established, and the time between checks can be extended.

3.2 Equipment Required to Calibrate a DPG

3.2.1 The following are needed to calibrate a DPG:

1. Pressure standard (primary or secondary).

2. Dry nitrogen or air (usually bottled gasses are used, but instrument air may be used if it is well filtered).

3. Pressure control devices; (valves, variable volumes and automatic pressure controllers).

4. To calibrate the output voltage, a digital voltmeter with a 5-digit resolution and an accuracy of 0.01% or better is required.

The connection of these items is shown in Figures 3.2(A) and 3.2(B).

3.2.2 The recommended pressure standards are listed below:

For Absolute and Differential Pressures up to 30 PSI:	
PRIMARY STANDARD	SECONDARY STANDARD
Capacitance mercury manometer Micrometer mercury manometer Air dead-weight tester	Quartz Manometer TM or Quartz Manometer/ Controller

For gauge pressures up to 500 PSI:	
PRIMARY STANDARD	SECONDARY STANDARD
Air dead-weight tester	Quartz Manometer TM or Quartz Manometer/ Controller

For gauge pressures up to 2500 PSI:	
PRIMARY STANDARD	SECONDARY STANDARD
Oil or water dead-weight tester	—

NOTE: Consult Mensor Corporation before attemping to calibrate the DPG with an oil or water dead-weight tester.

Quartz Manometer and Quartz Manometer/Controller are registered trademarks of Mensor Corporation.

3.3 Calibration Adjustments

3.3.1 The basic instrument zero and span adjustments are accessible from the outside of the case as shown in Figure 3.3(A). Routine calibration of the DPG can be accomplished with these controls, as described later.

3.3.2 Should it become necessary to calibrate the DPM, first remove the cover, then detach the DPM bracket from the chassis base. Tilt the DPM face upward to locate the control as shown in Figure 3.3(D).

3.3.3 Other controls are shown in Figure 3.3(C). These are factory-set and must not be disturbed without prior consultation with Mensor Corporation.

3.3.4 Calibration procedures described in this manual cover four instruments:

1. Differential DPG, Voltage Output

2. Differential DPG, Current Output

3. Absolute DPG, Voltage Output

4. Absolute DPG, Current Output

For each of these instruments, the procedures cover:

DPG: Zero/Span (Display)
Zero/Span (Current)

DPM: Zero/Full Scale

3.3.5 Normally, it should not be necessary to calibrate the DPM to obtain the accuracy specified for the DPG. However, if it is deemed necessary to calibrate the DPM, this must be done before calibrating the DPG because it will affect the total instrument accuracy.

Under normal circumstances, the only time it is necessary to calibrate the DPM is when the accuracy of the analog output voltage is important.

3.4 Differential and Gauge Pressure Calibration

3.4.1 Connect the DPG to a calibration set-up as shown in Figure 3.2(A) and allow it to warm up at room temperature for a minimum of one hour.

3.4.2 Calibrate the DPM if necessary, as outlined in Section 3.6.

3.4.3 Vent the reference and pressure ports to atmosphere, and adjust the front panel ZERO for a display of ± 00000.

NOTE: The pressure measured by the DPG is referred to a level 2 inches above the surface it is setting on. If the pressure is to be referred to another level, a correction should be applied for maximum accuracy as noted in Section 3.7.

3.4.4 Using a pressure standard, apply a calibrated pressure that is at or near the full span of the instrument. After the display has stabilized for 10-15 seconds, adjust the SPAN pot for a display reading of the applied pressure.

3.4.5 Apply calibrated pressure in increments of approximately 10% from zero to full scale. Record the DPG readings and the analog output voltages, if used.

NOTE: The linearity of the DPG has been corrected and set at the factory and should not change as long as the instrument has not been damaged or modified. Consult Mensor Corporation if it becomes necessary to change the DPG linearity.

3.4.6 When the current output option is installed in the DPG, the analog voltage output is replaced with a 4 to 20 milliamp current output on pins 22 and 23 of the rear connector. The current output is calibrated as follows:

3.4.7 Apply a zero differential pressure to the DPG. (See Section 1.5, Zero Adjustment.)

3.4.8 Connect an accurate digital ammeter to pins 22 and 23, or connect a precision resistor to these pins and use a digital voltmeter connected as shown in Figure 3.4.8.

3.4.9 With the DPG display indicating ± 00000, adjust the CURRENT ZERO pot, located on the rear of the instrument, for exactly 4.0000 milliamps. (See Figure 3.3(A) for location of adjustments.)

3.4.10 Apply a full scale or near full scale pressure to the DPG. Adjust the CURRENT SPAN pot for the correct output current, (Figure 3.3(A)). The following equation may be used to determine the output current for any input pressure:

$$\text{Output Current} = 16\left(\frac{\text{DPG Reading}}{\text{DPG Span}}\right) + 4 = \text{milliamps}$$

For example:

DPG Span = 40 PSI

DPG Reading = 38.000

$$\text{Output Current} = 16\left(\frac{38}{40}\right) + 4 = 19.200 \text{ milliamps}$$

NOTE: Since the current SPAN and ZERO adjustments affect each other slightly, the zero and span adjustments may have to be repeated until both readings are correct.

3.5 Absolute Pressure Calibration

3.5.1 Connect the DPG to a calibration set-up as shown in Figure 3.2(B) and allow it to warm up at room temperature for a minimum of one hour.

3.5.2 Calibrate the DPM as outlined in Section 3.6, if necessary.

3.5.3 Connect a vacuum gauge tube to one of the two rear pressure ports of the DPG and, using a good vacuum pump, evacuate the transducer and set the DPG ZERO as outlined in Section 1.5, Zero Adjustment.

NOTE: The pressure measured by the DPG is referred to a level 2 inches above the surface it is setting on. If the pressure is to be referred to another level, a correction should be applied for maximum accuracy as noted in Section 3.7.

3.5.4 Using a pressure standard, apply a calibrated full span pressure to the transducer and adjust the SPAN pot for the correct display reading.

3.5.5 Apply calibrated pressure in increments of approximately 10% from zero to full scale. Record the DPG readings and the analog output voltages, if used.

NOTE: The linearity of the DPG has been corrected and set at the factory and should not change as long as the instrument has not been damaged or modified. Consult Mensor Corporation if it becomes necessary to change the DPG linearity.

3.5.6 When the current option is installed in the DPG, the analog voltage output is replaced with a 4 to 20 milliamp current output on pins 22 and 23 of the rear connector.

The current output is calibrated as follows:

3.5.7 Apply a low absolute (ZERO) pressure to the DPG. (See Section 1.5, Zero Adjustment.)

3.5.8 Connect an accurate digital ammeter to pins 22 and 23, or connect a precision resistor to these pins and use a digital voltmeter connected as shown in Figure 3.4.8.

3.5.9 If the DPG display indicates ± 00000, adjust the CURRENT ZERO pot, located on the rear of the instrument, for exactly 4.0000 milliamps. (See Figure 3.3(A) for location of adjustments.) For low pressures other than 00000, set the current according to the equation and example below.

3.5.10 Apply a full scale or near full scale pressure to the DPG. Adjust the CURRENT SPAN pot for the correct output current, Figure 3.3(A). The following equation may be used to determine the output current for any input pressure:

$$\text{Output Current} = 16\left(\frac{\text{DPG Reading}}{\text{DPG Span}}\right) + 4 = \text{milliamps}$$

For example:

DPG Span = 40 PSI

DPG Reading = 38.000

$$\text{Output Current} = 16\left(\frac{38}{40}\right) + 4 = 19.200 \text{ milliamps}$$

NOTE: Since the current SPAN and ZERO adjustments affect each other slightly, the zero and span adjustments may have to be repeated until both readings are correct.

3.6 Digital Panel Meter (DPM) Calibration

3.6.1 The following procedure is used to calibrate the DPM so that the readout or display is proportional to the actual analog voltage of the transducer.

NOTE: Do not attempt to calibrate the DPM unless an accurate voltmeter is available. See Section 3.2.1(4).

3.6.2 Connect the DPG to a calibration set-up as shown in Figure 3.2(A) or 3.2(B) and allow it to warm up at room temperature for a minimum of one hour.

3.6.3 Locate the DPM adjustments per Section 3.3.2 and Figure 3.3(B) and 3.3(D).

3.6.4 Connect the digital voltmeter to the analog output of the instrument. (Pins 22 and 23 on the rear connector). An alternate connection for the meter is on the filter assembly located on the side of the DPM. See Figure 3.3(E).

3.6.5 With zero differential pressure applied to the transducer, connect a jumper wire between the analog output leads.

NOTE: On absolute instruments, a vacuum pump should be used to evacuate the PRESSURE port.

3.6.6 The DPM should display 00000. If not, adjust the DPM zero pot on the front of the DPM for a reading of ± 00000.

3.6.7 Zero Width Adjustment

The resolution of the meter is .0001 volt (100 microvolts). One minor division equals 100μV. The zero width, from -1 count to +1 count, should be 100 to 180 μV wide. This may be adjusted with the zero width pot on the side of the meter. See Figure 3.3(B).

3.6.8 Remove the jumper. If the test voltmeter and the display indicate any number other than 00000, adjust the front panel ZERO potentiometer for ± 00000. (Figure 3.3(A).) See Section 1.5 for proper setting of zero for absolute transducers.

Using a pressure standard, apply a calibrated full span or near full span pressure to the transducer and adjust the span pot for the correct analog voltage output. The correct analog output is calculated with the following equation:

$$\text{Analog Output Volts} = \frac{\text{Calibrated Pressure Applied}}{\text{Instrument Span}} \times 5$$

Example: 40" Hg Calibrated Pressure = 39.900

$$\text{Analog Output} = \left(\frac{39.9}{40}\right) 5 = 4.9875 \text{ Volts}$$

Since the DPM is scaled in pressure units it should read +39.900. Adjust the DPM full scale pot, (Figure 3.3(D)) for the correct indication.

NOTE: On instruments with spans less than 5 PSI, the analog output of the transducer will be scaled to the display directly.

For example:

Instrument Span.....2000 mm of H2O

Analog Output.....2.0000 volts

Display.....2000.0 mm H2O

3.7 Correcting for Head Pressure

Head pressure correction is a calculated correction that is applied to the pressure at the output of the pressure standard in order to correct for the weight of the column of gas or liquid between the standard and the instrument being calibrated. With this correction applied, the "True" pressure at the input port of the instrument being calibrated is known. See Figure 3.7.

3.7.1 The general equation for head pressure correction for a gas is:

$$P2 = P1(1 + \alpha h)$$

Where: P1 = Pressure at the output of the pressure standard (Absolute or Differential).

P2 = Actual true pressure at the transducer. (Absolute or Differential and same pressure units as P1.)

α = Gas density ratio at 23°C. (See Table 3.7.1.1 below.)

h = Inches difference in elevation between the pressure port, or reference level, on the standard and the reference level on the transducer under test. (h is negative (-) if the standard is lower than the transducer.)

3.7.1.1 Gas Density Ratio at 23°C

GAS		α DENSITY RATIO PER INCH
Air	(Dry)	2.9315×10^{-6}
Argon	(A)	4.0443×10^{-6}
Carbon Dioxide	(CO2)	4.4824×10^{-6}
Helium	(He)	4.0466×10^{-7}
Hydrogen	(H2)	2.0379×10^{-7}
Nitrogen	(N2)	2.8355×10^{-6}
Oxygen	(O2)	3.2402×10^{-6}

NOTE: The change in density ratio due to temperature changes is insignificant and may be ignored. However, for large changes in ambient temperature (over 15°C) a new α may be calculated:

$$\alpha 2 = \alpha [1 + (.003661)\ (23^\circ - T2^\circ)]$$

where: $\alpha 2$ = New α at T2

T2 = Actual temperature of gas

3.7.2 Head Correction Examples:

3.7.2.1 Given: A 100 PSID DPG with 10K count readout. The DPG reference is 24 inches below the QM/C standard pressure port. Air is being used for calibration.

Find: The true pressure at the DPG for 50 PSI and 100 PSI at the standard.

P2 = P1 [1 + (.0000029315) x (24)]

at 50 P2 = 50 [1.0000703561] = 50.00352 PSI

at 100 P2 = 100 [1.0000703561] = 100.007036 PSI

Since the DPG displays 10,000 counts, the instrument should be adjusted to indicate 100.01 at full scale with 100.000 PSI at the standard.

NOTE OF INTEREST: For any pressure range due to gas head pressure:

Max. %F.S. error = $\alpha(h) \times (100)$

α = Gas constant from chart

h = Reference level to reference level differential in inches

(The actual pressure range does not enter into the equation.)

3.7.3 The general equation for Liquid Head Pressure correction is:

$P2 = P1 + \alpha(h)$ (See Figure 3.7)

Where:

α = Liquid density at 23°C expressed in units which are compatible with P1, P2 and h. (See Table 3.7.3 below.)

h = Inches difference in elevation between the standard and the transducer under test. (h is negative (-) if the standard is lower than the transducer.)

TABLE 3.7.3 = (α) LIQUID DENSITY at 23°C

(α) Pressure Units used					
Liquid	PSI	IN.Hg	IN.H2O	mmHg	KPA
Water	.036127	.073556	1.0000	1.86833	.24909
Sea Water	.036974	.07528	1.02344	1.91213	.25492
Oil	.03071	.06253	.85005	1.58816	.211735
Kerosene	.029514	.06009	.81659	1.52631	.203489

3.7.3.1 Liquid Head Pressure Correction Example.

Given: Span is 100 PSI differential. Reference port is open to atmosphere. The transducer reference level is 10 inches below the standard, and the line is filled with water.

Find: The true pressure (P2) at the transducer for 100 PSI (P1) at the standard.

$P2 = P1 + \alpha(h)$

$P2 = 100 + (.036127) \times (10)$

P2 = 100.361 PSI at the transducer

NOTE: If the reference port of the transducer were connected to the reference of the standard and also filled with water to the same level as the pressure port, then there would be no correction due to head pressure because the two columns of water would cancel each other out. There would be zero net differential pressure due to head pressure.

3.7.4 Gas plus Liquid Head Pressure Correction

Figure 3.7.4 shows a setup using a gas to liquid separator tank. "hG" is the height in inches of the pressure standard above the liquid level in the tank. "hL" is the height of the liquid level in the tank above the instrument.

3.7.4.1 Where possible, the liquid level in the tank should be adjusted to the same height as the instrument port so that no liquid head pressure exists and only a gas head pressure need to be calculated. However, if this is not possible, the two head pressures must be calculated and both added to the standard pressure to find the true pressure at the instrument.

3.7.4.2 The equation for gas and liquid pressure correction is:

$$P2 = P1 [1 + (\alpha g)(hG)] + [(\alpha L)(hL)]$$

where:

P1 = Standard Pressure

P2 = True Pressure at Instrument

αg = Gas Constant

αL = Liquid Constant

hG = Inches from standard to liquid level in tank.

hL = Inches from liquid level in tank to instrument.

3.7.4.3 Example:

Given: 5 PSID DPG with 50K counts readout

The DPG reference level is 6 inches below the liquid level. (water)

The standard reference level is 24 inches above the liquid level. (Nitrogen is used.)

Find: The true pressure at the DPG for 5 PSI at the standard.

$$P2 = 5\ [1 + (.0000028355) \times (24)] + [(.036127) \times (6)]$$

$$= 5.00034026 + .216762$$

$$= 5.217102$$

The DPG would indicate 5.2171

NOTE: The measurement of the liquid level above the reference level of the instrument must be made as accurately as possible. For the example given in section 3.7.4.3, one count error on the DPG display is .00277 inches of water height.

When the level of the liquid is at the reference level of the instrument, with no pressure applied, the instrument should indicate zero.

4.0 THEORY OF OPERATION

4.1 General

The Mensor Model 11900 Digital Pressure Gauge is a self-contained pressure transducer with a digital readout. The instrument contains three basic modules: transducer assembly, readout assembly and power supply. This section is intended to provide an understanding of the general function of the unit and not detailed circuit explanations.

4.2 Block Diagram

The block diagram, Figure 4.2, shows the basic modules. As can be seen, the transducer assembly is further divided into the frame assembly case and the signal conditioning P.C. board.

4.3 Transducer Frame Assembly

The frame assembly contains a pressure sensing force-balanced system housed in a pressure tight case. In differential pressure models, the reference pressure surrounds the force-balanced system inside this case. The pressure to be measured is applied to a fused quartz Bourdon tube which applies a force (Fp) to a balance arm. This force is directly proportional to the differential pressure between the inside and outside of the Bourdon tube.

In absolute pressure models, the Bourdon tube is permanently evacuated and sealed to provide an absolute reference. The

pressure to be measured is then applied to the case around the outside of the Bourdon tube and thus the forces (Fp) and (Fm) are applied in the reverse direction on the balance arm.

When the pressure changes, the balance arm moves slightly from its center position; this movement is detected by sense coils and an AC signal is generated, the phase of which indicates the direction of movement.

This signal is processed by the signal conditioning board and a DC current is applied to the torque motor. This produces a force (Fm) on the balance arm that returns the arm to its center position and nulls the sense coils output. A change in force produced by the Bourdon is balanced by a proportional change in current in the motor.

4.4 Signal Conditioning Circuit Board (SCCB)

The SCCB contains all the electronic circuits needed to produce a linear analog output voltage and/or current, which is proportional to the pressure in the Bourdon tube. The SCCB provides, as standard, zero to 5VDC output for any Bourdon range above 5 PSI, and one volt per 10,000 counts of display below 5 PSI. The basic circuits are shown in Figure 4.2.

The SCCB is mounted on the side of the frame assembly and is connected electrically to the balance system through an 8-pin high pressure feedthrough connector.

4.4.1 Power Supply Inverter

This section of the SCCB provides isolation of the external 12V power supply as well as providing regulated ±8 VDC to the rest of the circuits. An isolated 25 VDC source to the optional current output circuits is also provided by this section. The power inverter circuits allow the other SCCB circuits to operate with negligible error over an input supply voltage range of 10 to 15 VDC.

4.4.2 Reference Oscillator

This is a free running sine wave oscillator that provides excitation to the sense coils in the frame assembly. It also provides the reference phase for the demodulator.

4.4.3 AC Amplifier and Demodulator

The AC amplifier receives the small error signal from the sense coils and boosts it to a level sufficient to be demodulated with little or no error.

The demodulator is a full wave phase sensitive detector that provides a plus or minus DC signal to the motor amplifier.

4.4.4 Coarse Zero Adjustment

This adjustment, pot R72, provides a ±2% (of span) coarse adjustment of zero. See Figure 4.3(B). This circuit changes the balance of the sense coils and is in the AC circuit ahead of the

AC amplifier. The use of this pot allows the normal front panel zero pot on the DPG to operate over a very limited range. This provides for greater stability and ease of zero setting.

4.4.5 Motor Amplifier

The motor amplifier converts the error signal to a direct current drive to the torque motor. This in turn produces the necessary force to balance the input pressure force.

4.4.6 Linearity and Temperature Correction Circuit

NOTE: Temperature and linearity adjustments are set at the factory and should not be changed without consulting Mensor Corporation.

The correction amplifier is part of the linearity and temperature correction circuit. This amplifier converts the torque motor current to an accurate voltage equivalent as well as providing zero adjustment for the transducer. Linearity and temperature compensation are also added to the signal at this point.

4.4.7 Output Amplifier

This amplifier provides the span adjustment as well as the necessary output voltage and current drive for the digital panel meter. It also provides the signal for the optional current output circuit.

4.4.8 Current Amplifier (Option H)

The optional current output (4 to 20 ma) is provided by a voltage to current amplifier circuit. Separate current span and zero adjustments are provided.

4.5 Readout Assembly

The readout assembly is a highly stable digital panel meter (DPM) with a 4-3/4 digit (39999) display. The DPM input is filtered and scaled to allow the meter to display the pressure in units proportional to the 5.0000 volt output of the transducer. Thus the instrument is direct reading in engineering pressure units.

The meter can be optionally modified to display up to 50000.

Example: If the pressure span is 20 PSI, then the transducer output will be 5 volts for 20 PSI. The DPM input would be divided down from 5 volts to 2 volts full scale, so that it could indicate 20.000 for 20 PSI.

The DPM also provides, as part of its circuitry, a parallel BCD auxiliary output that is equal to the displayed number.

4.5.1 Meter Over-ranging

On DPG's with the meter displaying 40000 full scale or less, the display will indicate an over-range condition by flashing all the digits on and off at about 4 flashes per second. The display will indicate the proper reading even though the input to the meter is 10% to 20% over full scale. The numbers will just flash.

If the 50000 count option is ordered with the DPG, the meter will not flash on and off for an over-range condition. The display will indicate proper readings up to about 52000 counts (5.2 volts). Input voltages up to ± 100 volts will not harm the meter. The transducer, however, can not output more than about ± 8 volts when over-pressured.

4.6 Power Supply

The power supply provides filtered, unregulated 12 volt DC power to the transducer. It can be connected to operate from 115 or 230 volt, 50/60 Hz mains.

APPENDIX A

Figures

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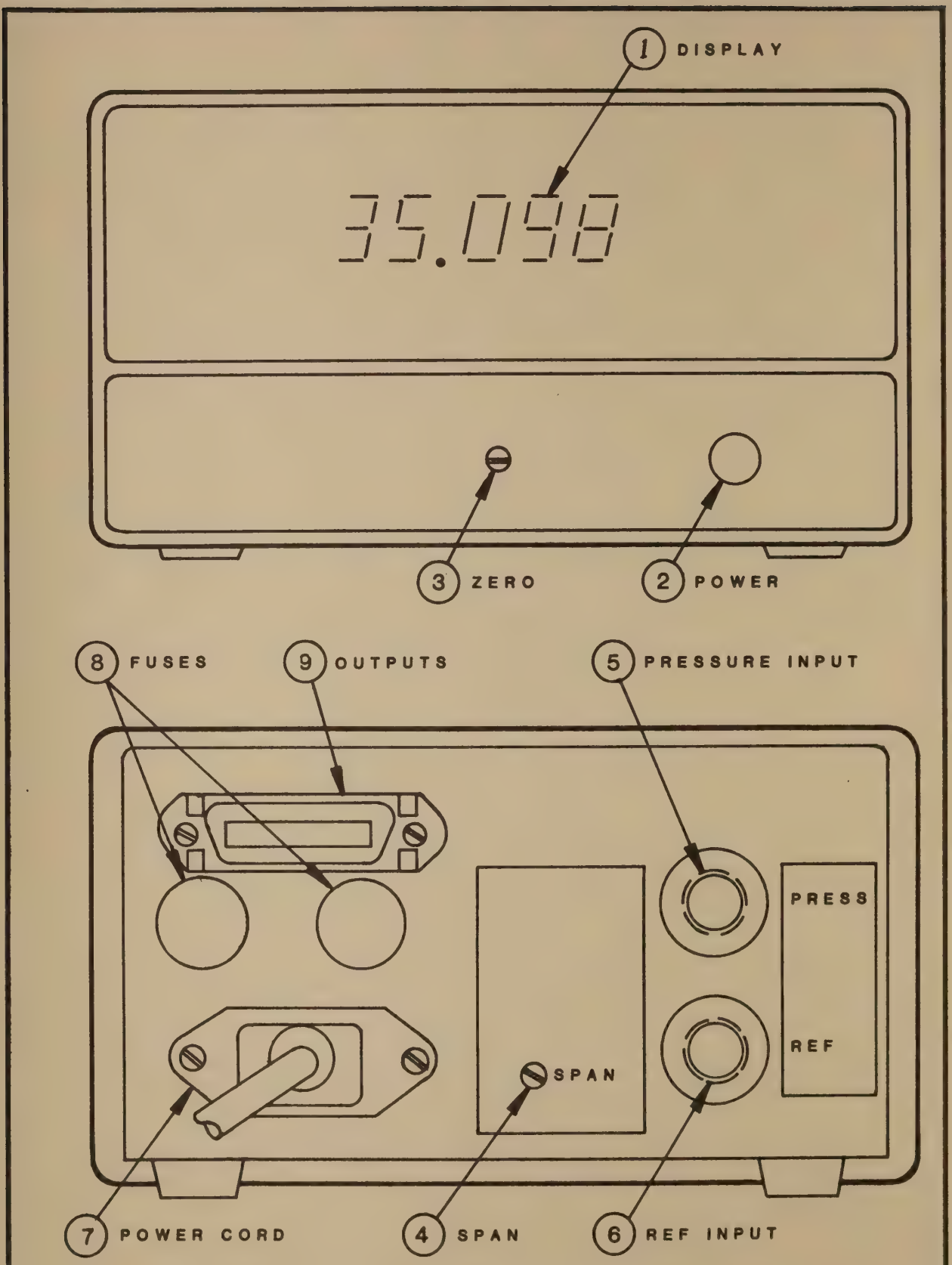
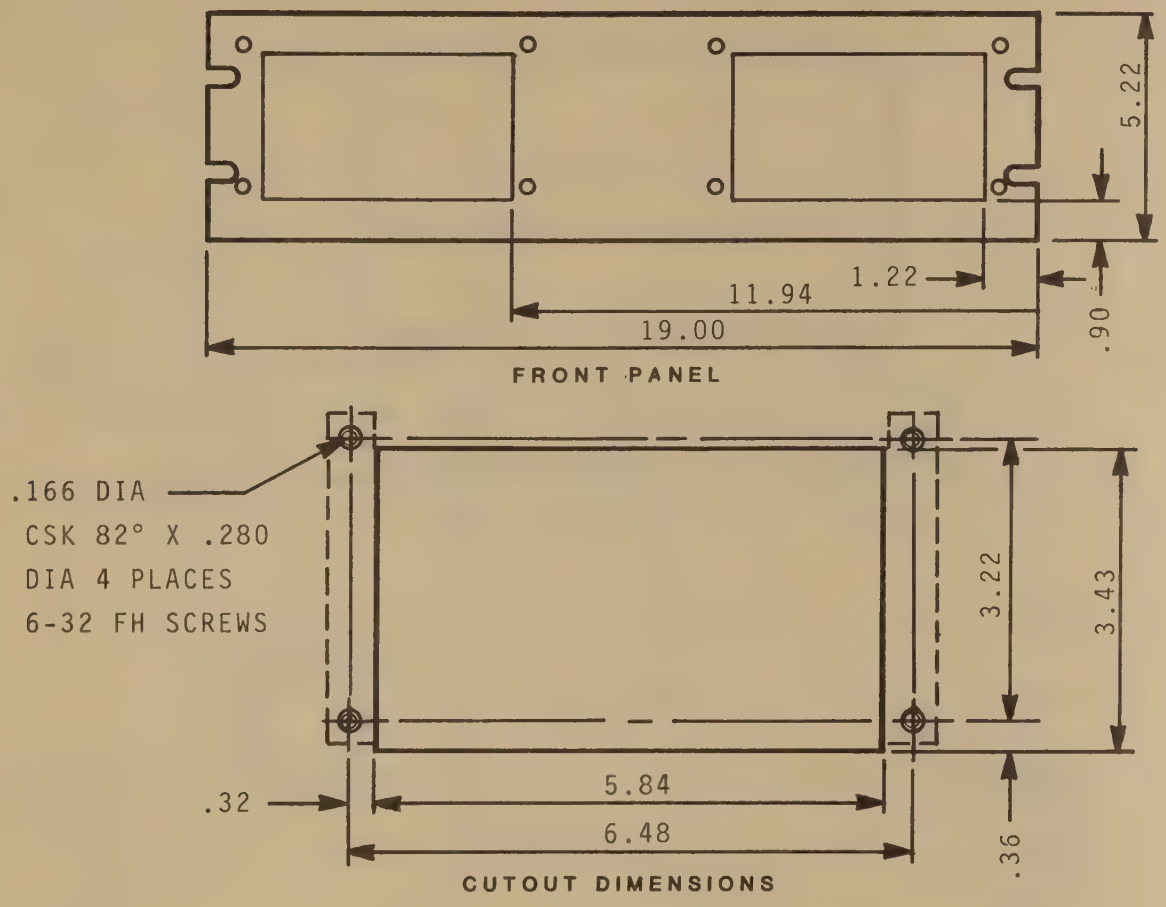


FIG. 1.2 – CONTROLS AND CONNECTIONS (SEE TABLE 1.2)



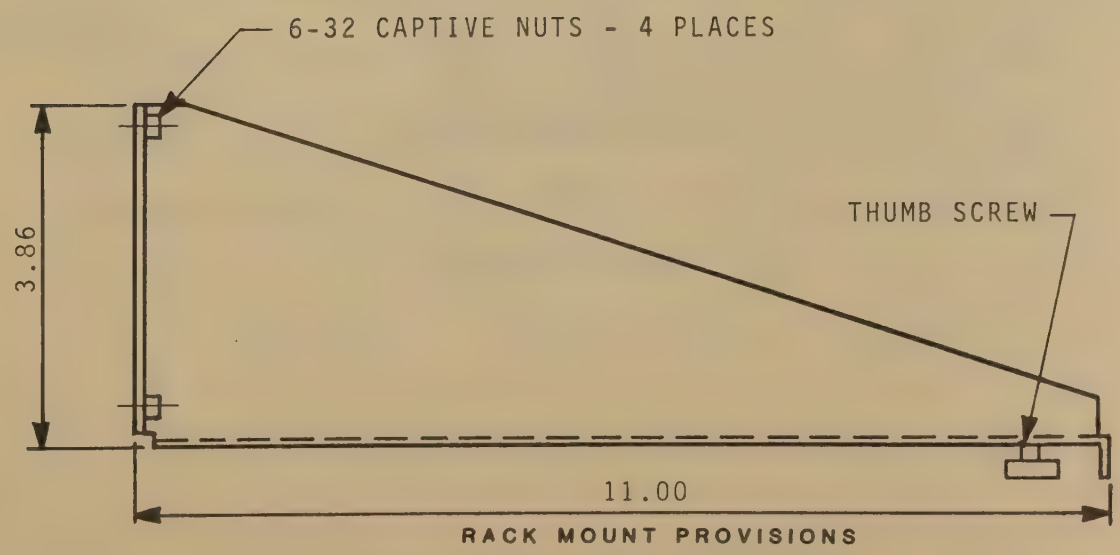
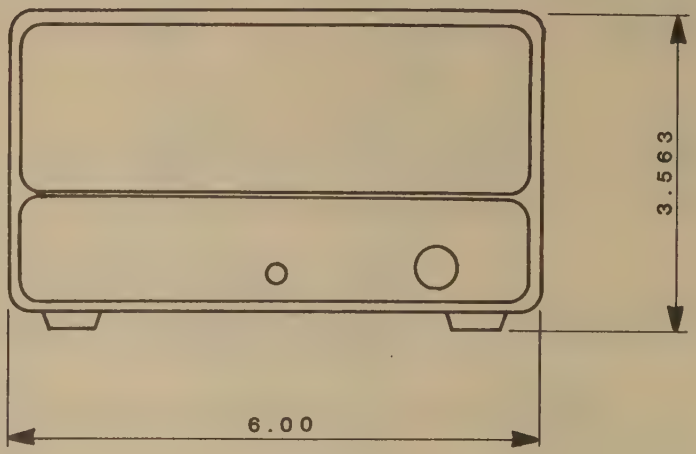
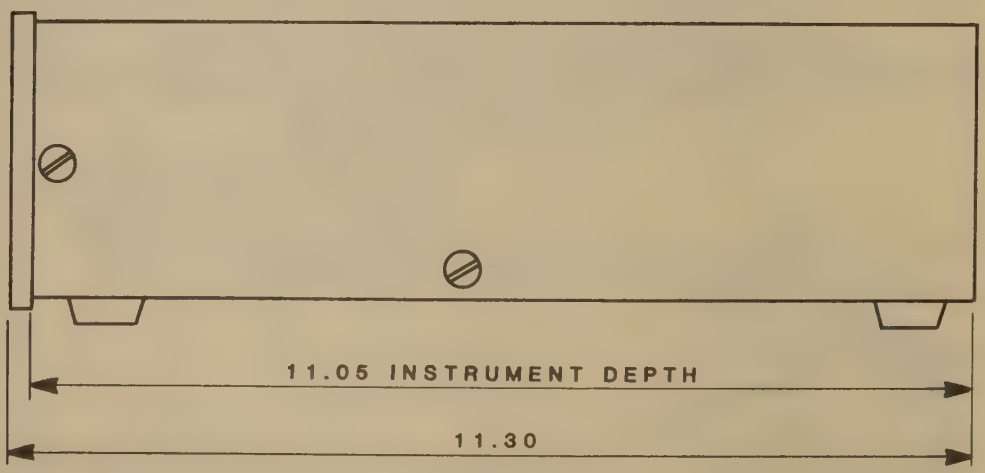


FIG. 2.2 - RACKMOUNT PROVISIONS



FRONT VIEW



SIDE VIEW

FIG. 2.3 - OUTLINE DIMENSIONS

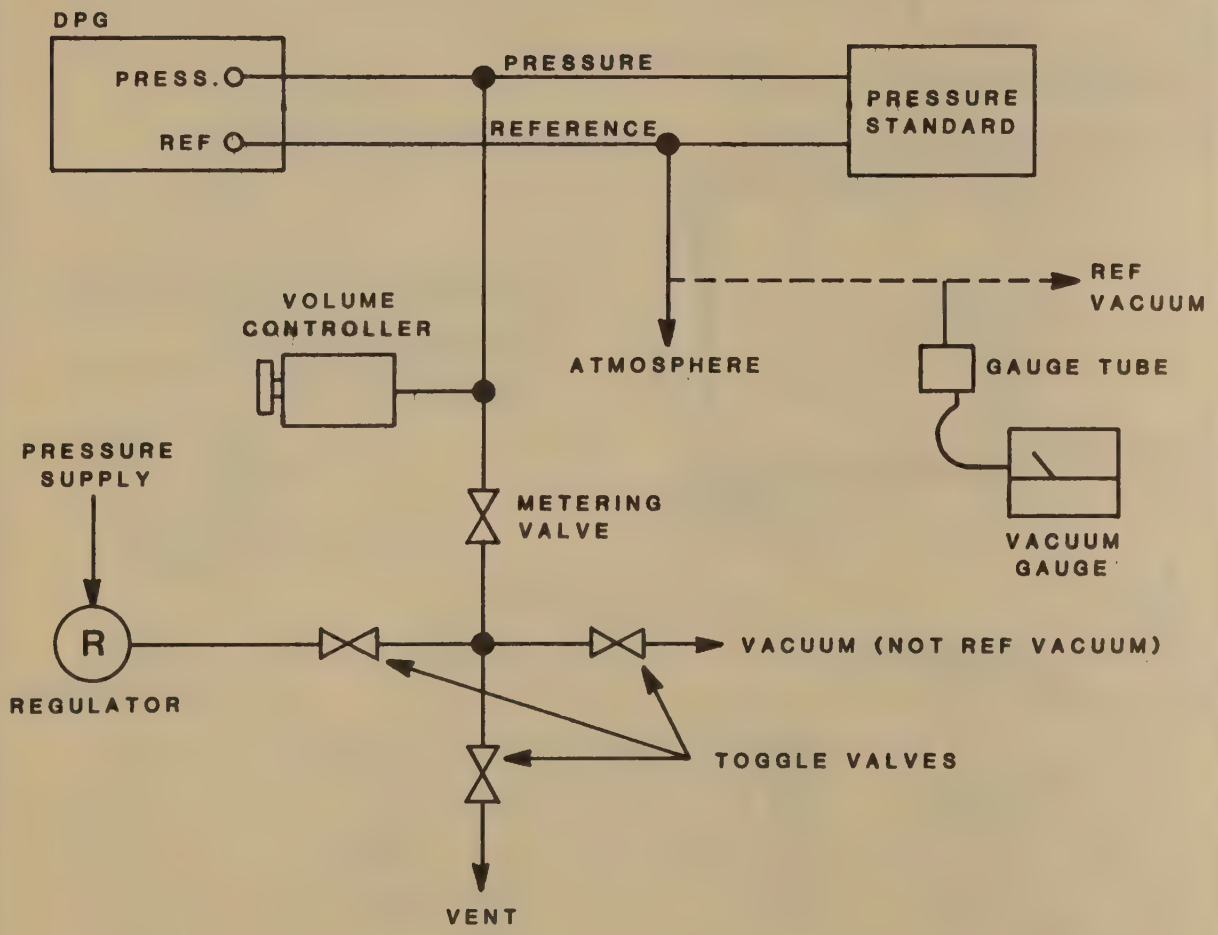


FIG. 3.2(A) - DIFFERENTIAL PRESSURE CALIBRATION OF THE DPG

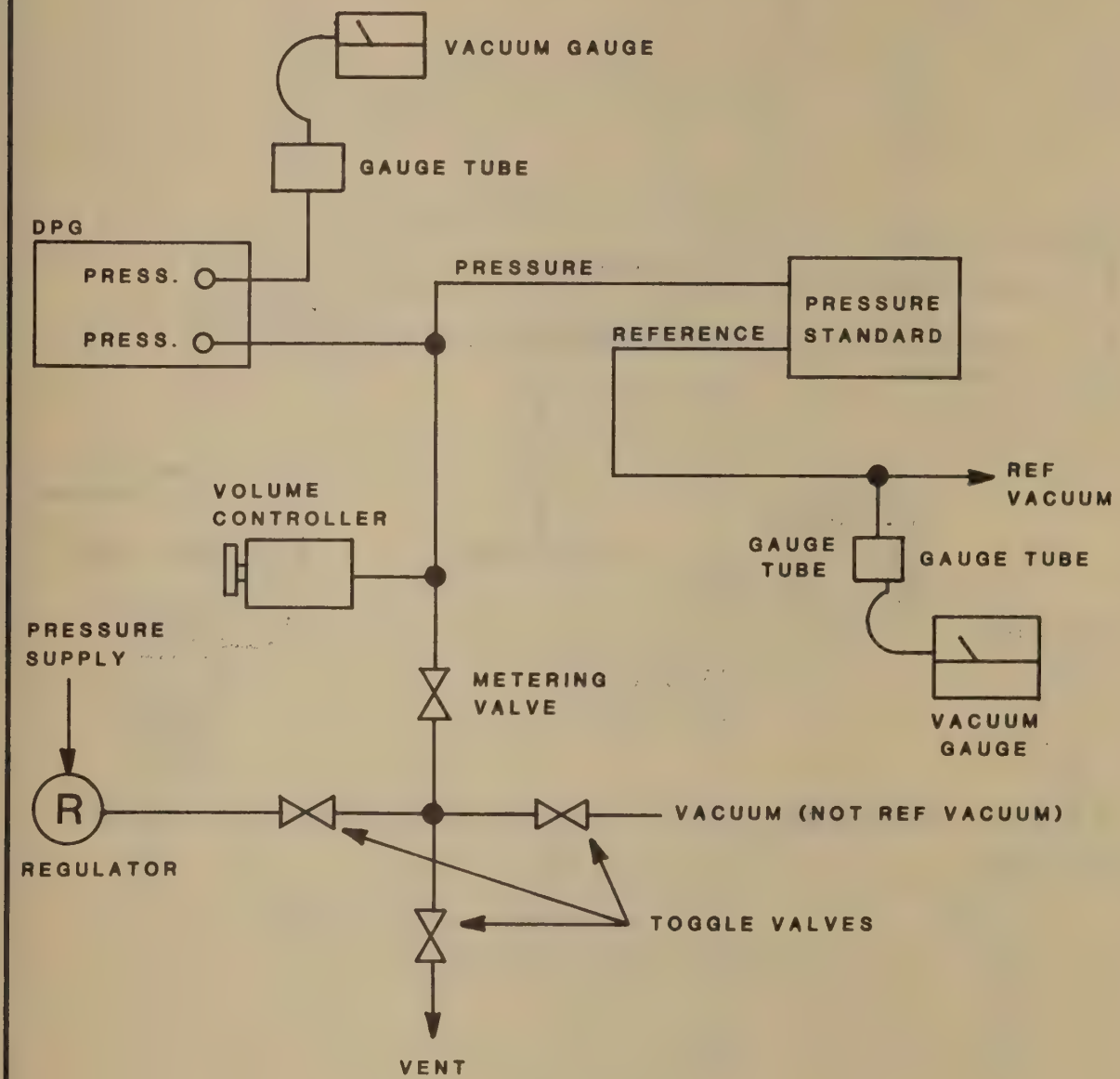


FIG. 3.2(B) - ABSOLUTE PRESSURE CALIBRATION OF THE DPG

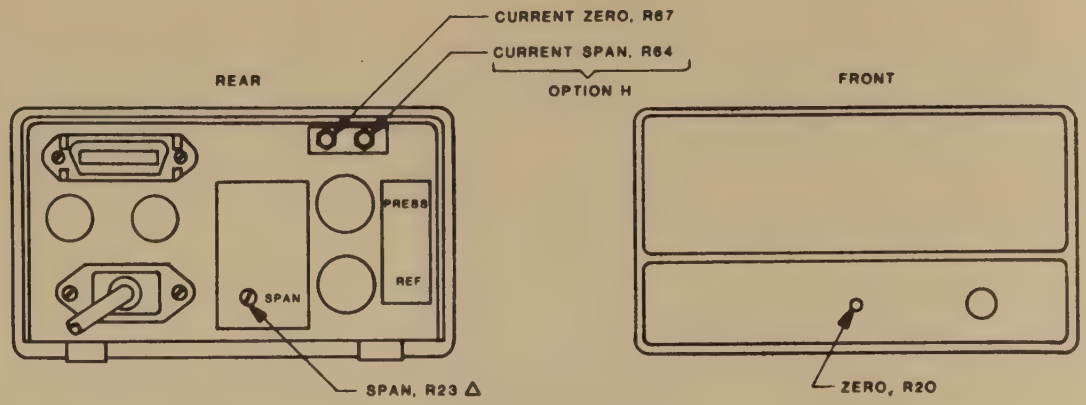


FIG.3.3(A) EXTERNAL ADJUSTMENTS

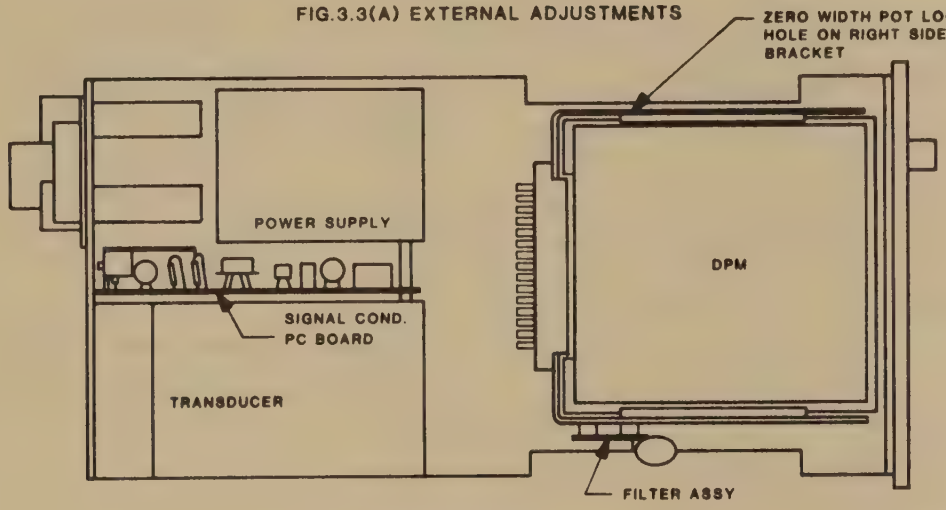


FIG.3.3(B) INTERNAL MODULES
TOP VIEW, COVER REMOVED FOR CLARITY

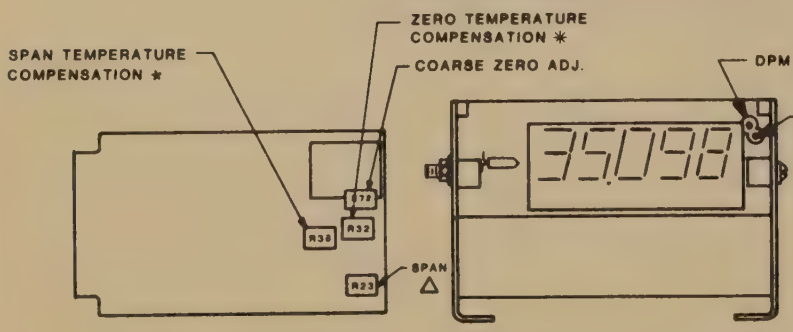


FIG.3.3(C) SIGNAL COND. CIRCUIT BOARD

FIG.3.3(D) FRONT VIEW OF DIGITAL PANEL METER

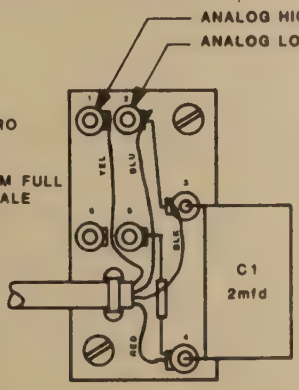
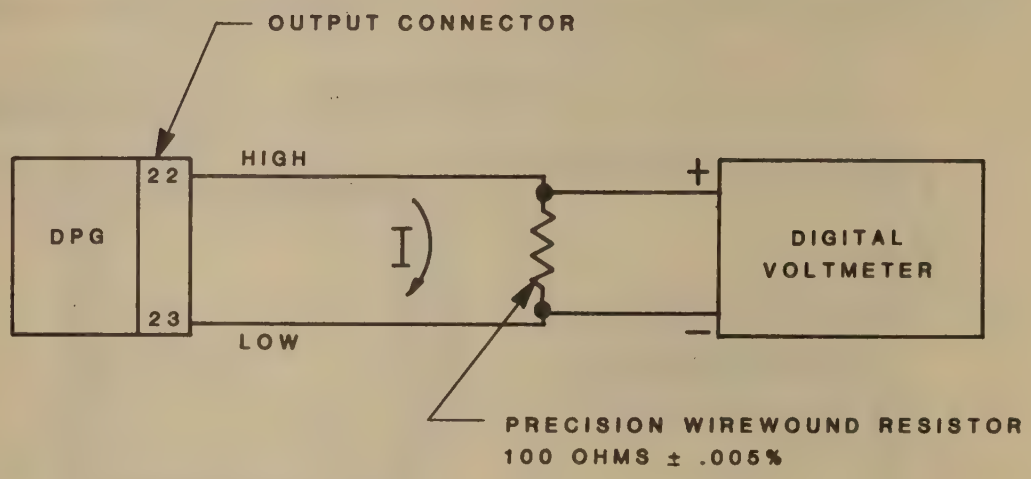


FIG.3.3(E) FILTER ASSY

*THESE ITEMS ARE FACTORY SET AND SHOULD NOT BE ADJUSTED.

ΔSPAN POT (R23) IS LOCATED ON THE SIGNAL CONDITIONING CIRCUIT BOARD (FIG.3.3(C) EXCEPT...(FIG.3.3(A).



100 MILLIVOLTS = 1 MILLIAMP

FIG. 3.4.W CURRENT CALIBRATION USING A DIGITAL VOLTMETER

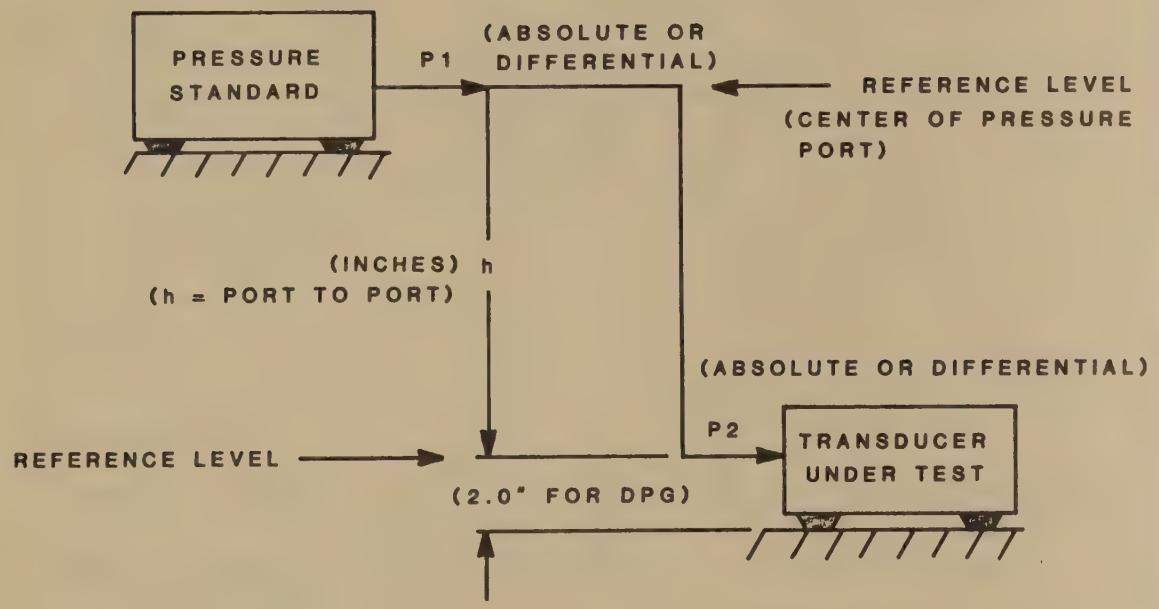


FIG. 3.7 - HEAD PRESSURE CORRECTION FOR GAS OR LIQUID

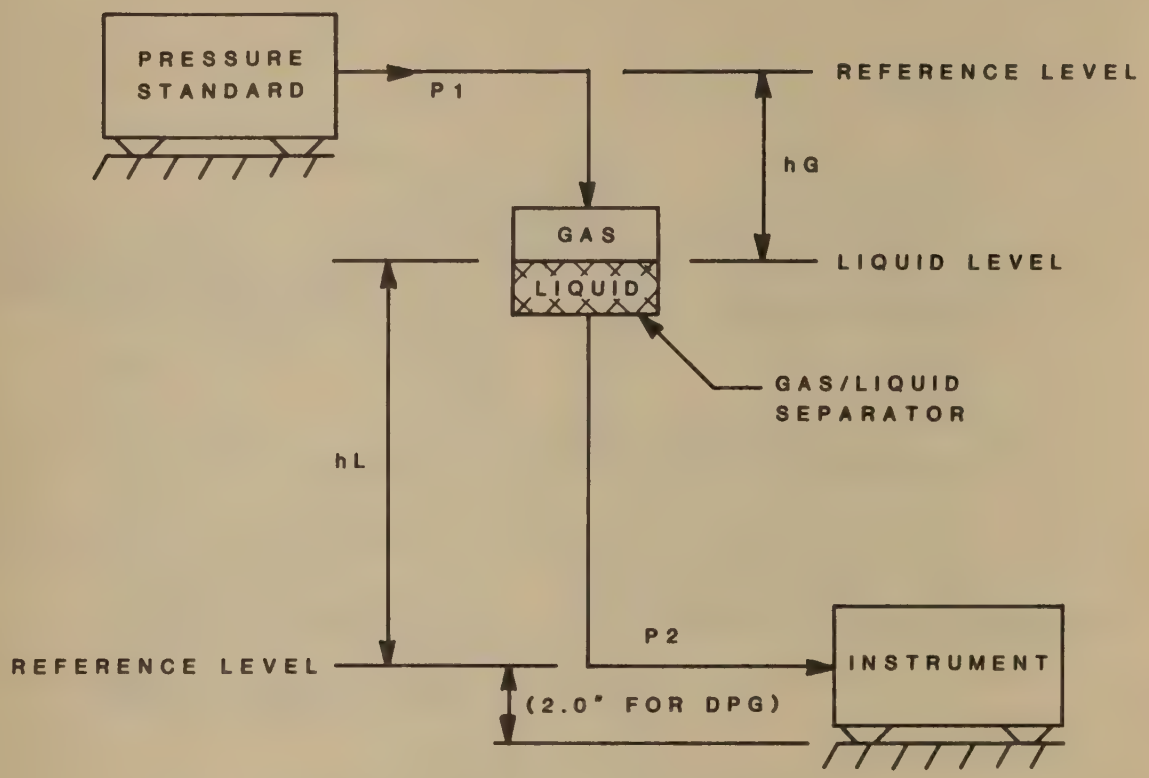


FIG. 5.7.4 - HEAD PRESSURE CORRECTION WITH GAS AND LIQUID

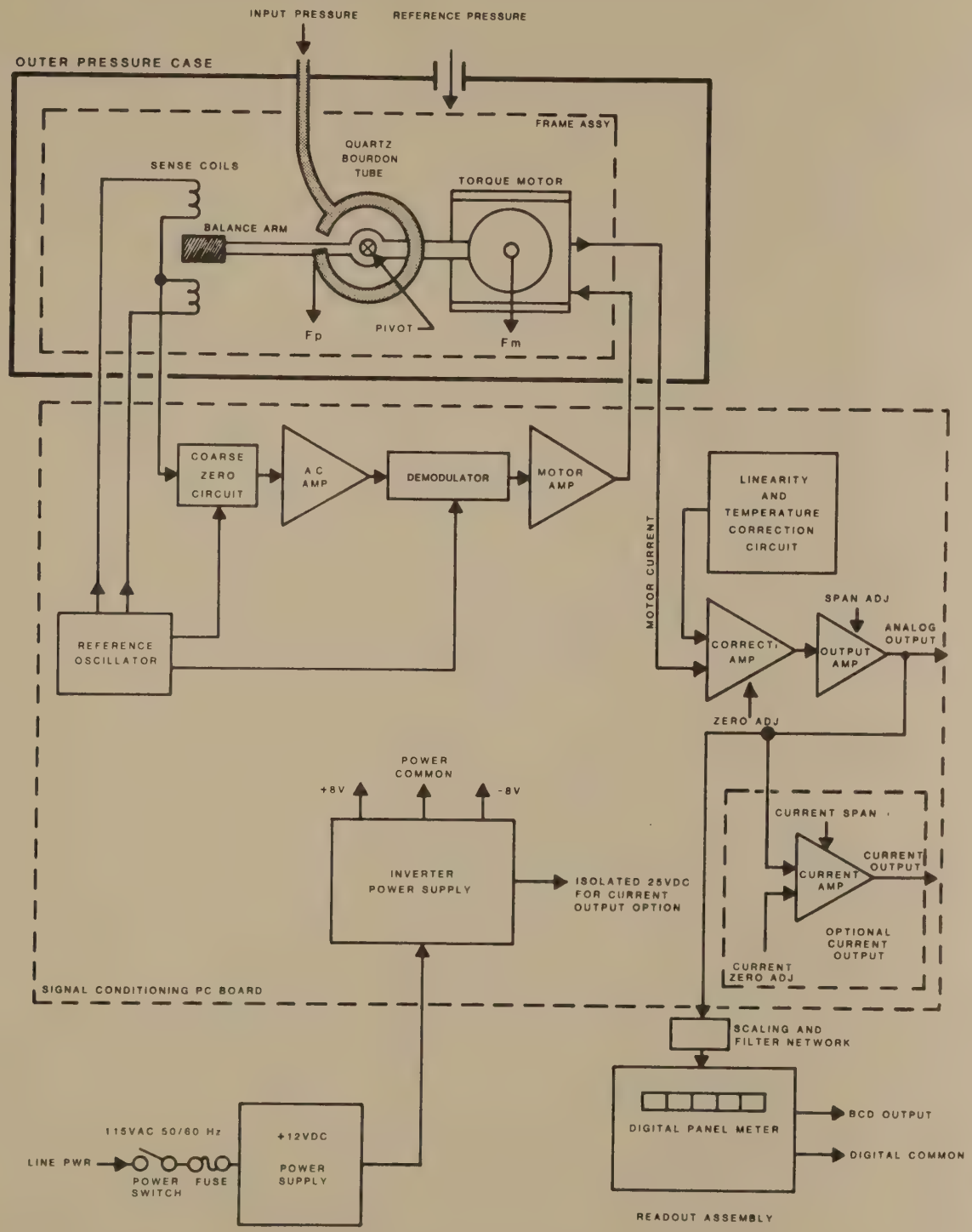


FIG. 4.2 BLOCK DIAGRAM

APPENDIX B

Tables

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TABLE 1.2 - CONTROLS AND CONNECTIONS

REF*	Control/ Connection	Description	Function
1	Display	7-segment planar indicators	Displays digital readout for a maximum count of 39,999 (optional 50,000). Decimal point is set to indicate value of a direct reading pressure. Sign is displayed automatically for negative pressures.
2	Power	Push-Push Switch	Applies power to the DPG from connected source. Green dot indicates power ON.
3	Zero	Screwdriver adjustment	A multi-turn pot used to set the display to indicate 00000 when zero or equal differential pressure is applied to the DPG.
4	Span	Screwdriver adjustment	A multi-turn pot used to set the proper full scale indication when a calibrated full span pressure is applied to the DPG pressure ports.
5	Pressure input	Female 1/8 inch NPT pressure port	Connection for positive input differential pressure or for an extra absolute input pressure port. On absolute units this port is usually the one used for connection of a thermocouple vacuum gauge tube.

REF*	Control/ Connection	Description	Function
6	Reference input	Female 1/4 inch NPT pressure port	Connection for the reference of a differential pressure, or atmospheric pressure for a gauge pressure instrument. On absolute units, this port is the input pressure port and is internally connected to the upper pressure port. For this reason, both ports are labeled PRESSURE.
7	Power cord	3-prong receptacle	A 3-prong receptacle used to connect the 7 1/2 foot power cord to the DPG.
8	Fuses	Fuse holders	Two fuse holders provide protection for both sides of the power line. 1/4 amp AGC fuses are used for 115VAC, 1/8 amp AGC for 230VAC.
9	Outputs	24 pin connector Amphenol #57-40240	External connection to analog and digital (BCD) outputs of the measured pressure. (See table 1.6.)

* Item numbers on figure 1.2.

TABLE 1.3.6 - SPAN RANGES FOR VARIOUS PRESSURE UNITS

Span range, min-max	Span	Least significant digit	Full-span display
	0-1	0.0001	1.0000
	0-2	0.0001	2.0000
	0-3	0.0001	3.0000
	0-4	0.0001	4.0000
	0-5	0.001	5.000
	0-6	0.001	6.000
	0-8	0.001	8.00
	0-10	0.001	10.000
	0-20	0.001	20.000
	0-30	0.001	30.000
	0-40	0.001	40.000
	0-50	0.01	50.00
	0-60	0.01	60.00
	0-80	0.01	80.00
	0-100	0.01	100.00
	0-200	0.01	200.00
	0-300	0.01	300.00
	0-400	0.01	400.00
	0-500	0.1	500.0
	0-600	0.1	600.0
	0-800	0.1	800.0
	0-1000	0.1	1000.0
	0-2000	0.1	2000.0
	0-3000	0.1	3000.0
	0-4000	0.1	4000.0
	0-5000	1	5000
	0-6000	1	6000
	0-8000	1	8000
	0-10000	1	10000

Conversion factor	Pressure units	PSI x conversion factor = pressure unit
(1) 703.08	mm H20	
(2) 27.68	in.H20	
2.2472	ft.seawater	
6.8947	kilopascals	
0.068947	bars	
68.947	millibars	
(2) 51.715	mm Hg	
(2) 2.0360	in.Hg	
1.0	psi	
.0680452	atm.	

Min absolute pressure span = 0-4 PSIA

Max absolute pressure span - 0-500 PSIA

(1) at 4°C
(2) at 0°C

TABLE 1.5.2 - CONVERTING VACUUM UNITS TO PRESSURE UNITS

MILLITORR	IN.HgA	PSIA	MILLITORR	IN.HgA	PSIA
1000	.03937	.01934	70	.00276	.00134
900	.03542	.01740	65	.00256	.00127
800	.03150	.01547	60	.00236	.00116
700	.02756	.01336	55	.00217	.00106
600	.02362	.01160	50	.00197	.00097
500	.01969	.00967	45	.00177	.00087
400	.01575	.00773	40	.00157	.00077
300	.01181	.00580	35	.00138	.00068
250	.00984	.00483	30	.00118	.00058
200	.00787	.00387	25	.00098	.00048
175	.00689	.00338	20	.00079	.00039
150	.00591	.00290	15	.00059	.00029
140	.00551	.00271	10	.00039	.00019
130	.00512	.00251	9	.00035	.00017
120	.00472	.00232	8	.00031	.00015
110	.00433	.00213	7	.00028	.00013
100	.00394	.00193	6	.00024	.00012
95	.00374	.00184	5	.00020	.00010
90	.00354	.00174	4	.00016	.00008
85	.00335	.00164	3	.00012	.00006
80	.00315	.00155	2	.00008	.00004
75	.00295	.00145	1	.00004	.00002

TABLE 1.6 - AUXILIARY INPUT/OUTPUT CONNECTOR

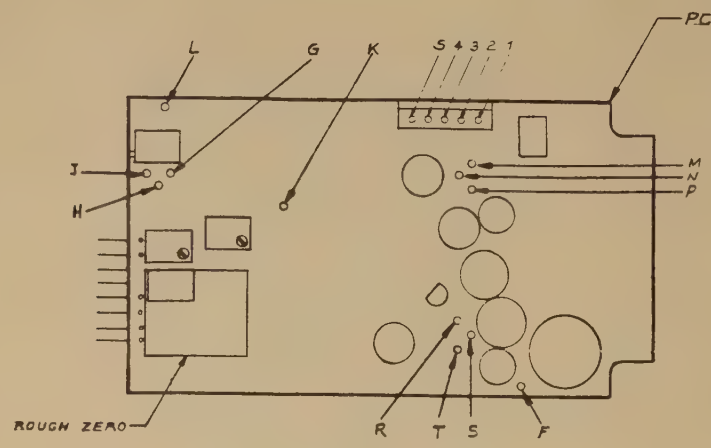
PIN	FUNCTION
1	1 ⎫
2	2 ⎬ 10^0
3	4 ⎬
4	8 ⎭
5	10 ⎫
6	20 ⎬ 10^1
7	40 ⎬
8	80 ⎭
9	100 ⎫
10	200 ⎬ 10^2
11	400 ⎬
12	800 ⎭
13	1K ⎫
14	2K ⎬ 10^3
15	4K ⎬
16	8K ⎭
17	10K ⎫ 10^4
18	20K ⎭
19	Inhibit (ground to hold) * (40K)
20	Polarity (high for positive)
21	Data Ready (low equals stable)
22	High ⎫ Analog output-voltage or
23	Low ⎭ optional current
24	Digital COMMON

*When the 50,000 count option is installed in the DPG, Pin 19 is used for 40K in place of the Inhibit function.

NOTE: The mating cable connector (supplied by Mensor Corporation) is Amphenol #57-30240.

APPENDIX C

Electrical Schematic



PIN LOCATIONS

NOTE 6

CURRENT SPAN — RG4 1K — Y, R, G, CW — YEL, RED, GRN

CURRENT ZERO — RG7 200 — Y, R, G, CW — YEL, RED, GRN

MAINS

115 VAC 50/60 Hz

WHT, GRN, BLK

J4 P4

F1 1/8 AMP

F2 1/8 AMP

S1

TOP VIEW

C1 .022/KV

C2 .022/KV

C3 2000 16V

T1 B11371-001

CRT-CR4

10.5 VAC

117 VAC

+12.5

CHASSIS GND

A3
POWER SUPPLY B10997-002

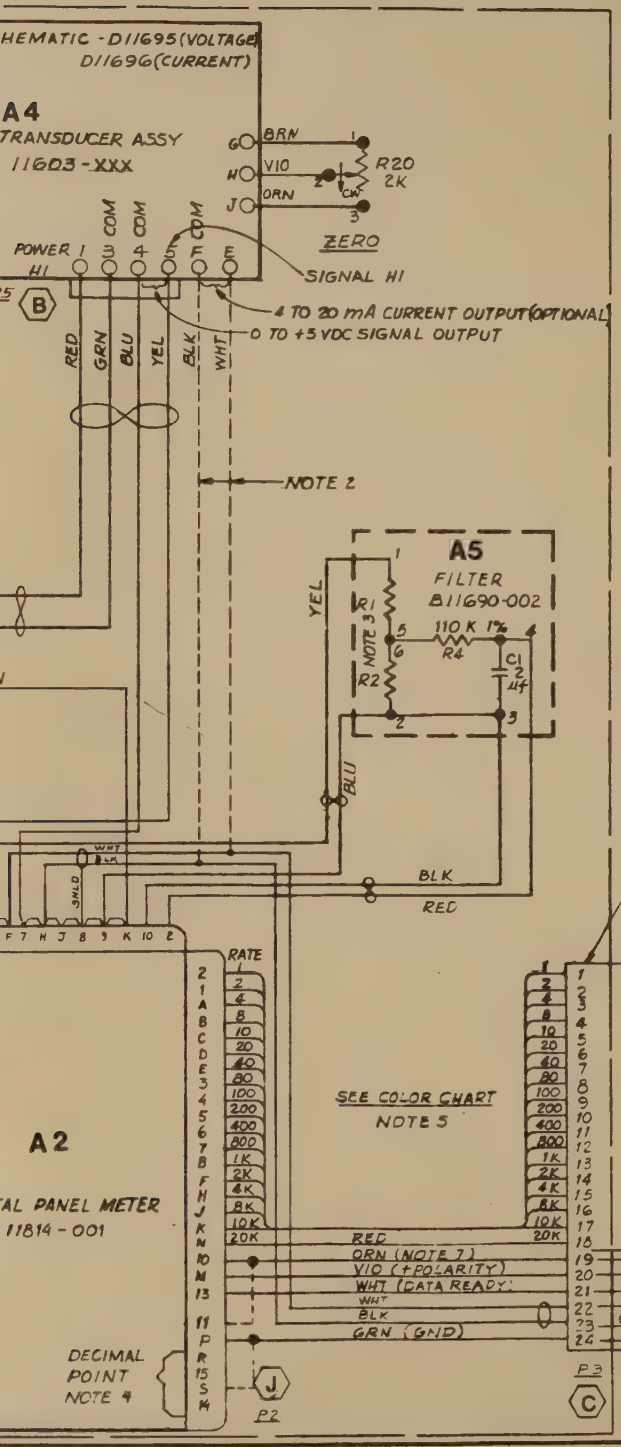
A1
DIGITAL PRESSURE GAUGE
11900-XXX

New 11814-003
Rebuilt 11814-004

P1

REVISIONS

A	ECN 1021 JK 4/69 FILTER 11620 WAS -001	
B		
C		
D		
E		
F	ECN 1021 JK 4/69 ADDED P1 & J1 CHG'D P1 & J1 PIN NOS.	
H		
J	ECN 1021 JK 4/69 ADDED 11627-T1 N/A PER SHEET WIRES AT CH-GND AT P1	



NOTES:

1. UNLESS OTHERWISE NOTED: CAPACITANCE VALUES ARE IN MICROFARADS, RESISTANCE VALUES ARE IN OHMS.
2. FOR DPG'S EQUIPPED WITH CURRENT OUTPUT OPTION THE FOLLOWING MODIFICATIONS SHOULD BE MADE. DISCONNECT SHIELDED CABLE (BLACK & WHITE WIRES) FROM PINS P1-6 AND P1-7. INSTALL 2 RECEPTACLES, (.058 DIA, AMP #60789-2ST) ON BLACK AND WHITE LEADS. CONNECT BLACK TO A4-F AND WHITE TO A4-E (ON TRANSDUCER PCB). PINS P3-22 AND P3-23 BECOME CURRENT OUTPUT HI AND COMMON RESPECTIVELY.
3. R1 AND R2 ARE SELECTED VALUES TO ATTENUATE THE TRANSDUCER OUTPUT SO THAT THE DPM WILL INDICATE IN THE PROPER ENGINEERING UNITS OF PRESSURE. REF: A 11964.
4. THE LOCATION OF THE DECIMAL POINT IS SET BY GROUNDING THE APPROPRIATE PIN; P2-R, 15, S, OR 14 TO PIN P.

PIN	DECIMAL POINT
R	3XXX.X
15	3XX.XX
S	3X.XXX
14	3.XXXX

5. COLOR CHART (FIRST DIGIT INDICATES WIRE COLOR.)

FIRST DIGIT	WIRE COLOR
1	BRN
2	RED
4	YEL
8	GRY

6. ON CURRENT OUTPUT (OPTIONAL) UNITS, THE CURRENT SPAN AND CURRENT ZERO POTS ARE MOUNTED ON THE REAR PANEL OF THE DPG.
7. P3-19 IS NORMALLY TIED TO P2-10 AND IS AN INHIBIT FUNCTION WHICH WILL HOLD THE DISPLAYED READING (AND THE PARALLEL BCD OUTPUT) WHILE GROUNDED TO PIN P3-24.
8. 50,000 COUNT OPTION: CONNECT P3-19 TO P2-11 TO ACHIEVE 50,000 COUNT BCD OUTPUT CAPABILITY. IN THIS MODE, INHIBIT FUNCTION (NOTE 7) IS NOT AVAILABLE.
9. ⬡ REFERENCE ONLY - DESIGNATES STATION ON HARNESS DRAWING D 11835.

- 001	ITEM NO.	QTY	DWG SIZE	PART NO	DESCRIPTION

UNLESS OTHERWISE SPECIFIED
DECIMAL .XX ± .02 .XXX ± .010
ANGULAR ± 1°
CONCENTRICITY MACHINED DIAMETERS .004 TIR
ALL DIMENSIONS TO BE MET BEFORE PLATING
REMOVE ALL BURRS AND SHARP EDGES
DO NOT SCALE THIS DRAWING
ALL DIMENSIONS IN INCHES
SURFACES MARKED ✓ TO HAVE
DRILLED HOLE TOLERANCES
.013 TO .136 + .003 − .002 | .136 TO .250 + .005 − .003 | .250 AND ABOVE ± .005

DR JAC 8-21-79
ENGR
APPD 9-26-79
APPD
REL
CHK C 10427
NEXT ASSY D 11900

MENSOR CORPORATION HOUSTON, TEXAS

WIRING DIAGRAM DPG CHASSIS

UNIT: DPG
D RF 11834 REV J

APPENDIX D

Inserts

NOTES

NOTES

NOTES

NOTES

2230 IH-35 SOUTH
SAN MARCOS, TEXAS 78666
(512) 396-4200
TELEX 776487

P/N 11840-001F
150, 10/84